Electronic Version
Stylesheet Version v1.1.1

Description

Adjustable Armrest

Background of Invention

[0001] This invention relates to an armrest that is adjustable in a radial plane of a pivot pin associated with a back member of a seat to align the armrest in a parallel relationship with a bottom member of the seat.

[0002] Currently available automobiles often have a seat with various controls whereby the position of the seat may be adjusted to accommodate individual seating preferences. The controls may include adjustments for an armrest and a back member. Initial armrests were designed to moved from an in-use position that is parallel with the bottom member of the seat to a non-use position the is parallel with the back member. Later the armrest was attached to the back member and the adjustment for the back member expanded from a substantially vertical position to a substantially horizontal position with respect to the bottom member of the seat. The armrest responds to alignment changes of the back member and as a consequence

when the back member is in a horizontal position, the armrest may be located at an inclined angle with respect to the seat. US Patents 5,702,157, 5,984,416 and 6,663,180 disclosure various components for adjusting the armrest to provide for selective alignment with respect to the seat. While the disclosed components provide for selective adjustment, the strength of the adjusting structure is limited through a single engaging pawl with a gear.

SUMMARY OF INVENTION

[0003] It is an object of this invention to provide an armrest with a mechanism to lock and retain the armrest in a desired position with respect to the bottom member of the seat as a back member is rotated between a substantially vertical and a horizontal position with respect to the seat.

[0004] The armrest has a housing that is defined by a U-shaped member with parallel first and second side walls each of which have a first end and a second end and an opening adjacent the second end. The housing is located on the back member by a first pivot pin attached to the back member that extends through the first opening in the first and second side walls and as a result the first end of the housing may pivot with respect to the first pivot pin. A first plate is fixed to the first pivot pin and located in a

first plane between the first and second side walls. The first plate has a peripheral surface with an arcuate segment removed to define a first stop and a second stop corresponding to limits of rotation of the housing with respect to the seat. A second plate is fixed to the first pivot pin and located in a second plane between the first plate and the second side wall. The second plate has an arcuate surface thereon with a first plurality of teeth thereon that extend from a first location associated with the first stop to a second location associated with the second stop. A first lever has a first end attached to the first side wall to define a cantilevered beam to position a second plurality of teeth adjacent said second end on said first plurality of teeth on the second plate. A second lever is located in the housing by a second pivot pin located between a first end and a second end. The second lever has an circular slot located adjacent the second end for receiving a ball. The second pivot pin locates the ball adjacent the second plate with the ball held in tangential engagement with the second side wall and in contact engagement with the first lever. An actuator member attached to the first end of the second lever receives an input force to cause the second end to pivot about the second pivot pin and move the ball

on the second side wall such that a force is applied to the first lever through the contact engagement such that the first lever is laterally moved toward the first side wall as a function of the resiliency of the cantilevered beam and correspondingly move the second plurality of teeth out of meshing engagement with the first plurality of teeth and into an aligned on the first plate between the first stop and the second stop. When the second plurality of teeth are aligned with the first plate, the first end of the housing may be moved by pivoting about the first pivot pin to a desired alignment with respect to the seat. When the end of the housing is at a desired alignment with respect to the seat, the input force is removed from the actuation member and internal resiliency of the cantilevered beam returns the second end of the first lever such that the second plurality of teeth again mesh with the first plurality of teeth to retain the first end of the housing in the desired alignment.

[0005] An advantage of this invention resides in a robust locking mechanism for armrest wherein a plurality of arcuate teeth are in meshing engagement with corresponding arcuate teeth on a plate fixed to a pivot pin on a back member.

[0006] It is further object of this invention to provide an armrest attached to a back member the may be rotated and retained in a parallel alignment with a seat rotating the back member between a vertical to a horizontal position.

Brief Description of Drawings

[0007] Figure l is a schematic illustration of a seat and a back member with an armrest made according to the present invention attached to the back member;

[0008] Figure 2 is an enlarged view of a portion of the armrest showing a rotational alignment that is necessary to maintain a parallel relationship with the bottom member of the seat as the back member is rotated from a substantial horizontal to a substantial vertical position;

[0009] Figure 3 is an end view of the armrest taken along lines 3-3 of Figure 1;

[0010] Figure 4 is a sectional side view taken along lines 4-4 of Figure 3 wherein the armrest is located in a fixed position on the back member in substantially parallel alignment with the seat; Figure 4a is a view of a stop plate for the retention arrangement of the armrest of Figure 1;

[0011] Figure 4b is a view of a ratchet plate of the retention arrangement of the armrest of Figure1;

[0012] Figure 5 is a view taken along lines 5-5 of Figure 4;

[0013] Figure 6 is a sectional side view of the armrest of Figure 1 wherein the component members have been moved to allow the armrest to be rotated with respect to the back member;

[0014] Figure 7 is a view taken along lines 7-7 of Figure 6;

[0015] Figure 8 is a view taken along lines 8-8 of Figure 4;

[0016] Figure 9 is a view taken along lines 9-9 of Figure 6;

[0017] Figure 10 is a schematic illustration of the armrest of Figure 4 with a secondary embodiment for the actuator;

[0018] Figure 11 is a view taken along lines 11-11 of Figure 10 with the armrest in a locked position with respect to the back member;

[0019] Figure 12 is a sectional view taken along lines 12-12 of Figure 10;

[0020] Figure 13 is a sectional view showing a relationship between the components of Figure 12 to permit movement of the armrest with respect to the back member;

[0021] Figure 14 is a sectional view of a secondary embodiment of a cantilever lever for the armrest of Figure 4;

[0022] Figure 15 is a view taken along lines 15-15 of Figure 14;

[0023] Figure 16 is a view showing a relationship between the components of Figure 14 to permit movement of the arm-

rest with respect to the back member;

[0024] Figure 17 is a schematic view of a secondary embodiment of an actuator for the armrest of Figure 4;

[0025] Figure 18 is a view taken along lines 18-18 of Figure 17; and

[0026] Figure 19 is a view taken along lines 19-19 of Figure 17.

DETAILED DESCRIPTION

[0027] In the illustrations of the various embodiment a same number identifies a same component is used therein without further detail unless some functional difference is achieved.

[0028] Figure 1 is a schematic illustration of a seat 10 having an armrest 12 that may be selectively adjusted from an in-use position that is approximately parallel with the base 11 of seat 10 to a stowed or rest position that is approximately parallel to the back member 14 of seat 10. The back member 14 as illustrated in Figure 2, may be may be rotated from a position "A" that is approximately perpendicular with the seat bottom 11 of seat 10 to an extreme position "C" that is approximately parallel with the seat bottom 11 of seat 10. The armrest 12 is secured to the frame work of the back member 14 by a pin 16 that ex-

tends therefrom and as shown by the dashed lines the pin 16 travels in an arc with respect to the seat bottom 11 of seat 10 as the back member 14 is moved between a vertical position "A" toward a horizontal position "C". In order to provide support for the arm of an individual, it is desirable to be able to adjust the armrest 12 to a conformable position and most often this position is in a plane that is parallel with the seat bottom 11 of seat 10. When the back member 14 is located in an extreme position "C" that approaches the horizontal plane should an individual attempt to return from a horizontal position to a vertical position a force is often applied to the armrest 12. Such a force can place extreme stress on an armrest 12 that may damage the position retention components. The present invention, provides for a robust structure that is capable of withstand a force applied to the armrest 12 that may approach 150 pounds before any stress would effect the retention components.

[0029] In more particular detail, the armrest 12 as best shown in Figures 2-9 is defined by a U-shaped housing 18 with parallel first 20 and second 22 side walls that each have a first end 24 and a second end 26 with an opening 28 located adjacent the second end 26. The housing 18 is lo-

cated on the back member 14 by the pin 16 extending through the opening 28 in the first 24 and second 26 side walls such that the first end 24 of the housing 18 may pivot with respect to pin 16.

[0030] A first plate 30, see Figure 4a, is fixed to the pin 16 and located between the first 20 and second 22 side walls. The plate 30 has an arcuate segment removed therefrom to define a first stop 32 and a second stop 34 such that when installed on pin 16 the first stop 32 is associated with a limit that end 24 may pivot toward back member 14 and the second stop 34 is associated with a limit that end 24 may pivot toward the seat bottom 11 of seat 10.

[0031] A second plate 36, see Figure 4b, is fixed to pin 16 and is located between the first plate 30 and the second 22 side wall. The second plate 36 has and arcuate segment 38 with a first plurality of teeth 40 thereon that extend from a first location 42 to a second location 44. The first location 42 is matched with the first stop 32 and the second location 44 is associated with the second stop 34. The first plate 30 and the second plate 36 are fixed to pin 16 and correspondingly move in an arc as the back member 14 is moved between the vertical to a horizontal position as illustrated in Figure 2.

[0032] A first lever 48 has a first end 50 that is fixed to the first 20 side wall adjacent the first end 24 to define a cantilevered beam that aligns a second end 52 in a position that is perpendicular to pin 16. A guide pin 54 that extends between the first 20 and second 22 side wall is located in an opening 55 on the second end 52 to assist in preventing the second end 52 from rotating in a plane with respect to the fixed end 50. A second plurality of teeth 56 are located on the first lever 48 adjacent the second end 52 that mesh with the first plurality of teeth 40 on the second plate 36. The mean radius of the first plurality of teeth 40 on the second plate 36 and the mean radius of the second plurality of teeth 56 are different and while they mesh a sufficient clearance is provided to allow the cantilever beam to laterally move without binding and yet define substantially total engagement there between.

[0033] A second lever 58 associated with the actuator 72 has a first end 60 and a second end 62. A pin 64 that is retained in the first 20 side wall and the second 22 side wall passes through the second lever 58 to define a pivot point and a guide 66 that is attached to the second 22 side wall engages the first end 60 to hold the second lever 58 in parallel alignment with the first lever 48. The second lever

58 has a circular slot 68 that is located adjacent the second 62 to retain a ball 70. The location of pin 64 within housing 18 is such that ball 70 is positioned adjacent plate 36 in tangential engagement with the second 22 side wall and in contact engagement with the first lever 48, as shown in Figure 8.

[0034] The actuator 72 that is attached to the first end 60 of lever 58 has sufficient length to extend past covering for housing 18 and to permit an individual to provide a force for un-locking the retention arrangement and move the armrest 12.

[0035] In a rest position, the components of the armrest 12 are engaged as shown in Figure 4 with the first 40 and second 56 teeth meshing to prevent the armrest 12 from rotating with respect to the back member 14. The armrest 12 provides comfort to rest the arm of an individual seated on the seat bottom 11 of seat 10. When an individual desires to adjust the position of back member 14 with respect to the seat bottom 11 of seat 10 an input force is applied by actuator 72 to the first end 60 of the second lever 58 that causes the second end 62 to pivot about pin 64 and move ball 70 along the second 22 side wall such that a force is applied to the first lever 48 through the contact engage-

ment with ball 70, see Figure 9, that causes the first lever 48 to laterally move toward the first 20 side wall as a function of the capability of the cantilevered beam to bend such that the second plurality of teeth 56 move out of engagement with the first plurality of teeth 40 and are aligned on the first plate 30 between the first stop 32 and the second stop 34, as illustrated in Figure 6 such and the first end 24 may thereafter pivot on pin 16 and be moved to a desired alignment with respect to the seat bottom 11 of seat 10. On termination of the input force through actuator 72 to end 60, the internal resiliently of the cantilevered beam of the first lever 48 returns the second end 52 to a perpendicular alignment with pin 16 such that the second plurality of teeth 56 adjacent end 52 mesh with the first plurality of teeth 40 on plate 36 to retain the first end 24 of housing 18 in a desired fixed alignment with respect to seat 10. The second guide 54 that engages the first lever 48 prevents radial movement of the second end 52 with respect to the second plate 36 that would permit the second plurality of teeth 56 from radially moving out of meshing engagement with the first plurality of teeth 40 and as a result substantially the entire arcuate length of the second plurality of teeth 40 remain engaged to hold

the first end 24 in the desired fixed alignment that may be selected anywhere between the first stop 32 and the second stop 34 on the first plate 30 that an individual chooses for comfort with respect to place an arm.

[0036] In an effort to simplify the armrest 12, an armrest 12a was developed that is identical to armrest 12 with the exception of the second lever 58 that was modified to define a lever 158 as illustrated in Figure 10, 11, 12 and 13. In armrest 12a, the ball circular slot 68 in lever 58 was eliminated and ball 70 was replaced by a semi-spherical projection 170 that was designed to extends toward the first side wall 20 and be located adjacent end 162 of lever 158. The pivot pin 64 extends through lever 158 and locates the semi-spherical projection 170 adjacent plate 36 and in contact with lever 48 at point 172 as illustrated in Figures 11 and 12 that is below the apex 174 of the semi-spherical projection 170. The end 162 has a plurality of tabs 164,164' that engage the second side wall 22 and with guide 66 hold the lever 158 in parallel alignment with side wall 22. The armrest 12a functions in a similar manner as armrest 12 in that an input force applied by actuator 72 causes lever 158 to pivot on pin 64 and move end 162 such that a force is applied through the semi-

spherical projection 170 as the point contact moves from point 172 toward the apex 174 as illustrated in Figure 13 to radially move end 52 of lever 48 toward the first side wall 20 as a function of the capability of the cantilevered beam to bend such that the second plurality of teeth 56 move out of engagement with the first plurality of teeth 40 and are aligned on the first plate 30 between the first stop 32 and the second stop 34, in a manner as illustrated in Figure 6 and thereafter allow the first end 24 to pivot on pin 16 and be alignment with respect to the seat bottomseat bottom 11 of seat 10.

[0037] Figure 14 illustrates an embodiment of armrest 12b that is derived from armrest 12 by modifying lever 48 to define lever 248, plate 36 to define plate 236 and eliminate plate 30. In more particular detail, lever 248 has a first end 50 and a second end 252 with the first end 50 being fixed to the first side wall 20 adjacent the first end 24 of housing 18 to define a cantilevered beam. Lever 248 has an opening 258 adjacent the second end 252 with a plurality of inwardly extending radial teeth 270 that extend around the entire circumference of opening 258. Plate 236 is fixed on pin 16 and it too has a plurality of outwardly extending radial teeth 240. The mean diameter of the out-

wardly extending radial teeth 240 and mean diameter of the inwardly extending radial teeth 270 is such that they mesh but allow for lateral movement of the cantilever beam defined by lever 248. In armrest 12b with end 50 fixed to side wall 20, the end 262 of lever 248 is located in a perpendicular relationship with pin 16 such that the inwardly extending radial teeth 270 and outwardly extending radial teeth 240 are aligned in a same radial plane, as shown in Figure 15. When it is desirous to move armrest 12b an input force is applied to actuator 72 that causes lever 58 to pivot about pin 64 and move end 62 such that ball 70 tangentially engages side wall 22 and the contact with lever 248 moves to the apex 174 of ball 70 such that end 252 laterally moves toward side wall 20 and correspondingly move the inwardly extending radial teeth 270 out of meshing engagement with the outwardly extending radial teeth 240, as illustrated in Figure 16. With inwardly extending radial teeth 270 located around pin 16, end 24 of housing 18 may be rotated 360 degrees to any position that would be comfortable for an occupant of seat 12. When a desired position is achieved, the input force on actuator 72 is removed and the internal resiliency of the cantilevered beam returns the second end 252 to

perpendicular alignment with pin 16 where the inwardly extending radial teeth 270 a total mesh occurs with teeth 240 to hold the end 24 in a fixed position with respect to the back member 14. In returning to the perpendicular alignment, guide 54 assists in assuring the meshing of the teeth occur as it may be necessary to apply a small adjusting input if the teeth are located in a position that is in-between the individual apex of the plurality of teeth.

[0038] The armrest 12b was modified to define armrest 12c by combining lever 58 and actuator 72 into a unitary actuator assembly as illustrated in Figure 17. This actuator assembly includes lever 358 that has a first end 360 that extends past guide 382 and a second end 362 that extends past a second edge of guide 382 toward the top 19 of the U-shaped housing 18. Lever 358 has a cylindrical opening or slot 368 that receives a ball 370 and tabs 374,374' that engage the base 384 of guide 382. When guide 382 is attached to side wall 22, ball 370 tangentially engages side wall 22 and a portion thereof is in contact with lever 248 as illustrated in Figures 18 and 19. When an occupant desires to adjust armrest 12c, an input force is applied to end 360 causing lever 358 to slide within guide 382 and roll ball 370 on side wall 22 while at the same time later-

ally moving lever 248 toward the first wall 20 as the contact engagement of ball 370 with lever 248 moves toward the apex of the ball 370 to move the inwardly extending radial teeth 270 out of meshing engagement with the outwardly extending radial teeth 240 in a manner as illustrated in Figure 16. With inwardly extending radial teeth 270 located around pin 16, end 24 of housing 18 may be rotated 360 degrees to any position that would be comfortable for an occupant of seat 12. When a desired position is achieved, the input force on end 360 is removed and the internal resiliency of the cantilevered beam returns the second end 252 to perpendicular alignment with pin 16 where the inwardly extending radial teeth 270 mesh with teeth 240 to hold the end 24 in a fixed position with respect to the back member 14.